# O & M INSPECTION REPORT
# FOR NAVIGATION AND SHORE PROTECTION PROJECTS

1. Project Name: Kahului DDH

2. Date of Inspection: September 16-17, 2002

3. Inspection Personnel:

| | Name | Agency/Office | Telephone No. |
|---|---|---|---|
| a. | Pat Tom | COE | 438-8874 |
| b. | Eric Li | COE | 438-8862 |

4. Discussion:

* = From report date 14-15 August 2001 using Dan's Stationing (see note below).

An inspection of the East B/W, and the West B/W were conducted.

NOTE:

We have been using multiple sets of stationing for the East B/W in our past inspections over the years because this B/W has been repair several times using different stationing (refer to Kahului East B/W Stationing Map in report attachments). The two separate sets of stationing currently being used are:

1. The first is Dan Meyers' Stationing, which runs from station 0+00 to 33+32 (running east to west beginning at the revetment and ending at the East B/W head). These stations were also used for the aerial photo maps for the ribcap and head section. We believe that the original construction of the East B/W was based on stationing similar to this.

2. Back in 1982, the revetment section of the East B/W was repaired using a separate set of stationing which began at Sta. 13+75 of the East B/W - however, a new stationing was used for this revetment repair project designating the East B/W Sta. 13+75 to Revetment Sta. 0+00 running eastward to Revetment Sta. 7+25. A recent repair to an adjacent section of this revetment continued this stationing to run from Revetment Sta. 7+25 to Revetment Sta. 18+80.

Therefore, to clear matters up once and for all, we have decided to use the following stationing in future inspections, since future repair work on the East B/W and revetment structures will be based on this stationing:

East B/W: Sta. 13+73 - Sta. 27+66 (running east to west)
Revetment: Sta. 0+00 - Sta. 18+25 (running west to east)

However, for this inspection report, we will identify the stationing in both the Dan Meyers stationing and the new stationing.

Equivalent East B/W stations are:

| Sections | Dan's Station | Miscellaneous Station |
|---|---|---|
| Revetment (Pre-Final) | 0+55 to 11+55 | Revetment Sta. 7+25 to Revetment Sta. 18+25 |
| Revetment (Hatashima) | 11+55 to 18+80 | Revetment Sta. 0+00 to Revetment Sta. 7+25 |
| East B/W Undefined | 18+80 to 24+55 | East B/W Sta. 13+75 to East B/W Sta. 19+50 |
| East B/W Ribcap** | 24+55 to 32+76 | East B/W Sta. 19+50 to East B/W Sta. 27+66 |
| East B/W Head | 32+76 | East B/W Sta. 27+66 |

**Note Dan's Station follows true length (821'). Miscellaneous Station Part I follows straight imaginary baseline (800').

The West B/W uses only one set of stationing, which runs from 0+00 to 23+15.

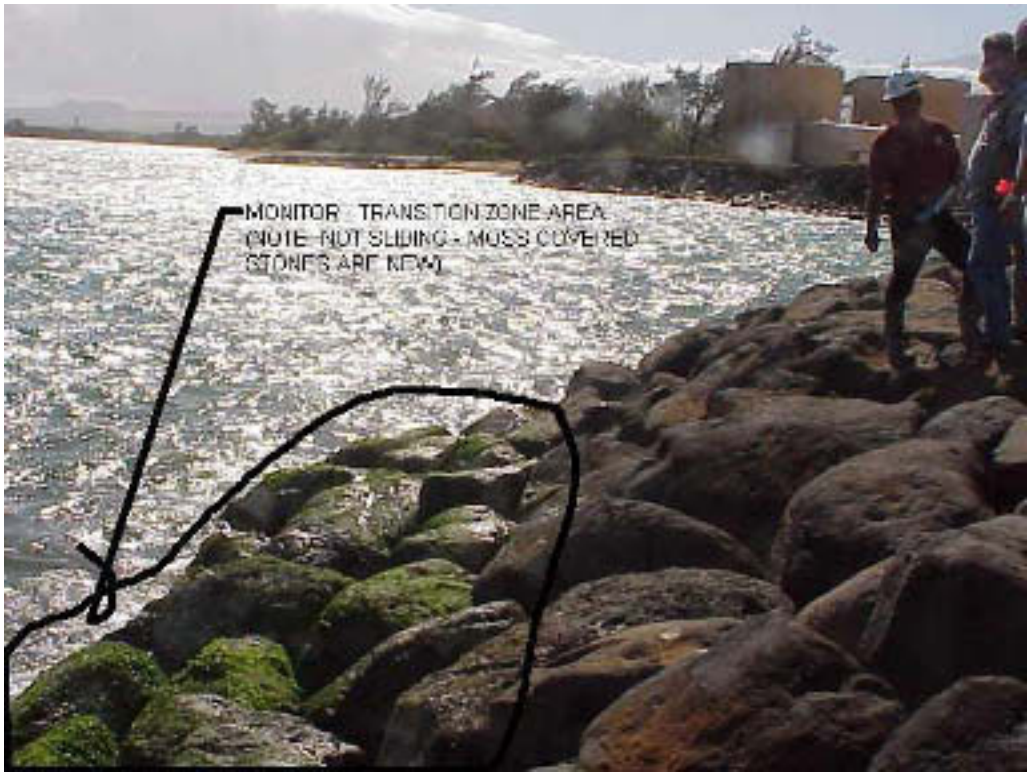
State DOT is continuing their contract work on the Kahului Pier 1 extension (approx. 300'), which they anticipate completing in Dec 02. Pat Tom has contacted Marshall Ando of State DOT to discuss: 1) the resetting of temporarily relocated tribars (relocated for Pier 1 Extension work) back into the breakwater between existing tribars and the Pier 1 Extension; and 2) the removal of miscellaneous Pier 1 Extension materials from our East B/W and revetment structures when their construction work is completed. See photo below:

The noted discrepancies are as follows:

**EAST BREAKWATER - RE-CONSTRUCTED REVETTED MOLE SECTION**

**DAN'S STA (Sta. 0+55 TO 11+55) =**
**Revement Sta. 7+25 to 18+25**

Conducted Pre-final inspection of the recently repaired (East B/W) revetment. Purpose of inspection was to check for quality control of armor stones and placement of armor stones.
Attendees were:
US Army Corps of Engineers: Steve Takeguchi, Stan Boc, Tim Philips, Pat Tom, Glen Kusaka, and Eric Li
Contractor: Lance Sutsumi




a. Dan's Sta. 3+20 = Revetment Sta. 15+60
Monitor transition zone area. Note - moss covered stone area is not sliding; it was constructed like this. Armor stones placed near the water line by the contractor were covered by moss within a week.

Overview from Dan’s Sta. 10+00 to 0+55 = Revetment Sta. 8+80 to 18+25.


Overview from Dan’s Sta. 10+00 to 11+55 = Revetment Sta. 8+80 to 7+25.

## EAST BREAKWATER - REVETMENT SECTION (HATASHIMA)

**DAN'S STA (Sta. 11+55 TO 18+80) =**
**Revetment Sta. 7+25 to 0+00**

b. Dan's Sta. 12+35 = Revetment Sta. 6+45, Crest, fractured armor stone (no picture).

c. Dan's Sta. 12+45 = Revetment Sta. 6+35, Crest, fractured armor stone (no picture).


Overview from Dan's Sta. 13+05 to 11+55 = Revetment Sta. 5+75 to 7+25. (Note: Fence @ Dan's Sta. 12+48 = Revetment Sta. 6+32).

Overview from Dan's Sta. 13+05 to 18+80 = Revetment Sta. 5+75 to 0+00.

d. *Dan's Sta. 13+00 = Revetment Sta. 5+80
Monitor armor stone @ toe (no picture).

e. *Dan's Sta. 14+00 = Revetment Sta. 4+80
1 armor stone dislodged @ toe, monitor

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f. *Dan's Sta. 14+50 = Revetment Sta. 4+30, bridging @ crest.

g. Dan's Sta. 17+30 = Revetment Sta. 1+50, Crest, remove construction materials - metal sheet and wooden crate (no picture).

h. *Dan's Sta. 17+75 to 18+25 = Revetment Sta. 1+05 to 0+55, Monitor armor stones @ toe (no picture).

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*Dan's Sta. 18+25 = Revetment Sta. 0+55, OS, No change in Armor Stone @ toe.

*(Note: Dan's Sta. 18+25 = Revetment Sta. 0+55 Begin wall; Dan's Sta. 18+85 = East B/W Sta. 13+75 Bend in wall)

i. Dan's Sta. 18+80 = East B/W Sta. 0+00, Crest, Pier 1 Extension contractor to remove cylindrical rubber sleeve from breakwater at end of his construction work.

## EAST BREAKWATER - UNDEFINED SECTION

**DAN'S STA. (Sta. 18+80 TO 24+55) =**
**East B/W Sta. 13+75 to 19+50**

j. Dan's Sta. 19+80 = East B/W Sta. 14+75, Crest, fractured armor stone (no picture).

*(Note: Dan's Sta. 20+45 = East B/W Sta. 15+40 Begin concrete pad)

k. Dan's Sta. 19+95 to 24+55 = East B/W Sta. 14+90 to 19+50, Crest, portion of breakwater seems to be lower than the breakwater in previous stations; possible settling of breakwater. Also breakwater seems a bit steeper from Dan's Sta. 24+30 to 24+55 = East B/W Sta. 19+50 to 19+75. Continue to monitor.


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l. *Dan's Sta. 24+55, OS, split armor stones.

State Harbors' Extension of Pier 1, HS of B/W (2002 Photo).


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*State Harbors' Extension of Pier 1, HS of B/W (2001 Photo).

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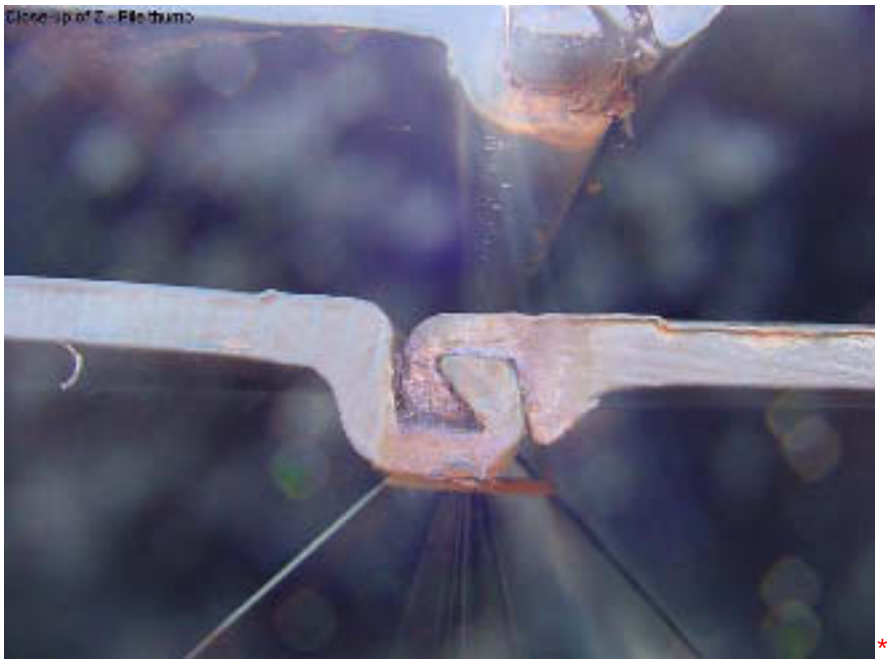
*Overview of Pier 1 Fill, HS (2001 Photo).

State Harbors' Extension of Pier 1, HS of B/W (2002 Photo).

 *

*Close-up of Z - Pile to be used @ Pier 1 extension.

## EAST BREAKWATER - RIBCAP SECTION

**DAN'S STA. (Sta. 24+55 TO 32+76) =**
**East B/W Sta. 19+50 to 27+50**

(REACH 2A Dan's Sta. 24+55 to 26+14 = East B/W Sta. 19+50 to 21+09)

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m. *Dan's Sta. 21+45 = EAst B/W Sta. ???, OS, 3ea. broken dolos.

n. Dan's Sta. 24+55 = East B/W Sta. 19+50, HS, tribars moved for pier construction. Contractor will move some of the tribars back to fill void between pier and existing tribars.

o. *Dan's Sta. 24+78, OS, broken dolos (fluke/tip) - (no picture).

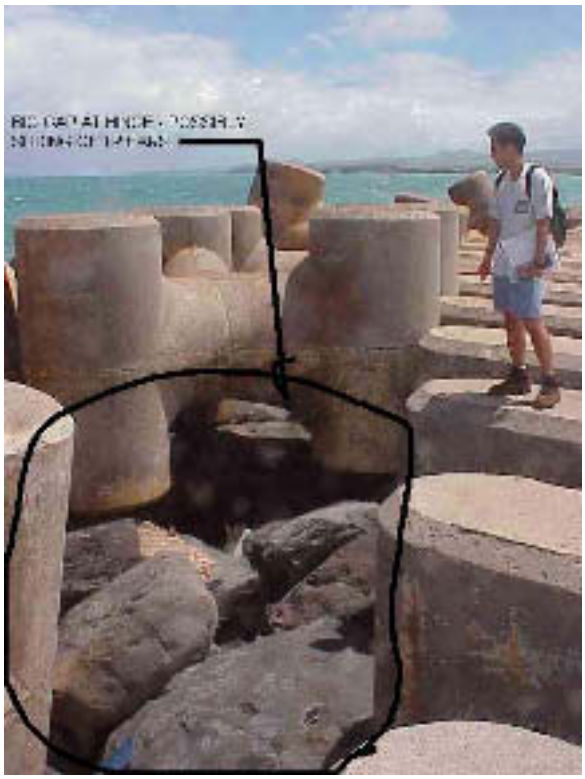
p. *Dan's Sta., OS, 1 broken dolos (shank) - (no picture).

q. *Dan's Sta., OS, 1 broken dolos (shank/fluke) - (no picture).

r. *Dan's Sta., OS, 1 broken dolos (shank/fluke) - (no picture).

s. *Dan's Sta., OS, 1 broken dolos (shank/fluke) - (no picture).

t. Dan's Sta. 24+85 = East B/W Sta. 19+80, OS, broken tribar leg with rebar exposed.



u. Dan's Sta. 24+85 = East B/W Sta. 19+80, OS, big gap at hinge; side slope may be sliding.

v. *Dan's Sta. 25+25, OS, 4 broken dolos - (no picture).

w. Dan's Sta. 25+27 = East B/W Sta. 20+22, OS, 3 Dolos all on side slope: 2 - broken shanks and 1 - cracked shank.

x. *Dan's Sta. 25+30, 2 Broken dolo, OS, @ RibCap hinge - (no picture).

y. Dan's Sta. 25+39 = East B/W Sta. 20+34, OS, 1 dolos with broken shank (no picture).

z. *Dan's Sta. 25+45, OS, 3 broken dolos (1ea shank/fluke; 2ea fluke/shank) - (no picture).

aa. *Dan's Sta. , OS, multi cracks in fluke (not broken) - (no picture).

bb. *Dan's Sta. , OS, settling, sideslope - (no picture).

cc. *Dan's Sta. , 1 Broken dolo, OS, @ RibCap hinge - (no picture).

dd. *Dan's Sta. , 1 Broken dolo, OS, @ RibCap hinge - (no picture).

ee. *Dan's Sta. 25+50, OS, 1 broken dolos (shank/fluke) - (no picture).

ff. *Dan's Sta. 25+53, OS, dolo separation 3" from RC - (no picture).

gg. *Dan's Sta. 25+67, OS, dolo separation 10" from RC - (no picture).

hh. *Dan's Sta. 25+82, OS, dolo separation 2" from RC - (no picture).

ii. Dan's Sta. 25+93 to 26+11 = East B/W Sta. 20+88 to 21+06, OS, thinning of dolos section. 3 Dolos: 2 - broken shanks and 1 - fluke shank break.

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jj. *Dan's Sta. 26+07, OS, dolo separation 6" from RC.

kk. *Dan's Sta. 26+10, os, broken dolo # 12 7/11/77(shank)

(REACH 2B Dan's Sta. 26+15 to 28+99 = East B/W Sta. 21+10 to 23+94)

ll. *Dan's Sta. 26+17, OS, dolo separation 6" from RC (no picture).

mm. *Dan's Sta. 26+27, OS, dolo separation 6" from RC (no picture).

nn. Dan's Sta. 26+35 = East B/W Sta. 21+30, OS, 1 - dolo cracking and spalling with exposed rust (no picture).

oo. *Dan's Sta. 26+98, -45DEG, 60' radius shank break on tribar & "flipped" on side (no picture).

pp. Dan's Sta. 27+07 = East B/W Sta. 22+02, OS, 1 - dolo fluke tip slightly chipped at water line (no picture).

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qq. *Dan’s Sta. 27+50, HS, material washed-out from under crane turn around.

rr. *Dan’s Sta. 27+52, OS, dolo separation 1” from RC.

Overview from Dan’s Sta. 27+61 to Pier = East B/W Sta. 22+56 to Pier, HS.

(REACH 2C Dan's Sta. 29+00 to 30+49 = East B/W Sta. 21+10 to 23+94)

(Note: *Dan's Sta. 29+00 begin tribar and Red Cross)

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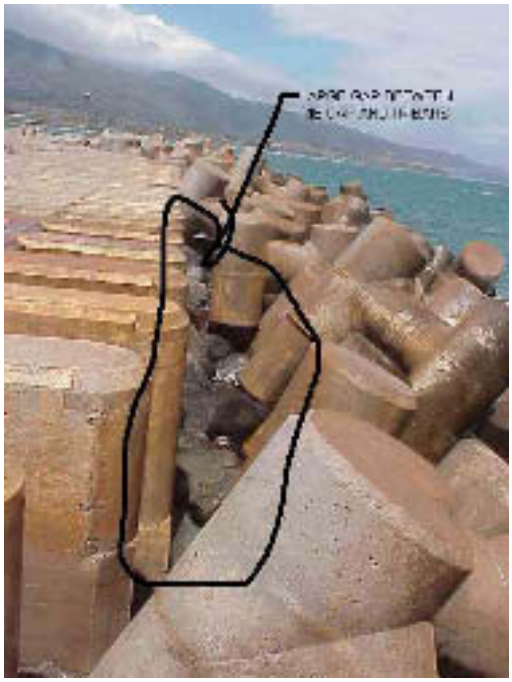
ss. *Dan's Sta. 29+30 - Sta. 30+30, OS, 10' gap between tribars & ribcap 10' x 30' in length.



tt. Dan's Sta. 29+18 to 29+42 = East B/W Sta. 24+18 to 24+42, OS, large gap between ribcap and tribars; possible side slope failure. Monitor as required. Left Picture looking towards head. Right Picture looking towards root.

uu. Dan's Sta. 29+24 = East B/W Sta. 24+24, OS, filler in expansion joint missing on concrete ribcap (see similar picture "ddd").

vv. Dan's Sta. 29+77 = East B/W Sta. 24+72, OS, filler in expansion joint missing on concrete ribcap (see similar picture "ddd").

ww. Dan's Sta. 30+25 = East B/W Sta. 25+20, OS, filler in expansion joint missing on concrete ribcap (see similar picture "ddd").

xx. Dan's Sta. 30+37 = East B/W Sta. 25+32, OS, Spalling of ribcap and rusted rebar is exposed (2002 photo).

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yy. *Dan's Sta. 30+35, OS, rebar exposed in ribcap & spalling. (2001 photo).

(*Dans' Sta. 30+49 Red Cross)

zz. *Dans' Sta. 30+32, Exposed UL caused by tribar movement from ribcap.

(REACH 2D Dan's Sta. 30+50 to 31+19 = East B/W Sta. 25+45 to 26+14)
(*Note: Short directional change)

aaa. Dan's Sta. 30+73 = East B/W Sta. 25+68, OS, filler in expansion joint missing on concrete ribcap (see similar picture "ddd").

bbb. *Dan's Sta. 30+92 - 31+22, Monitor 10' gap between RC and tribars, UL exposed.


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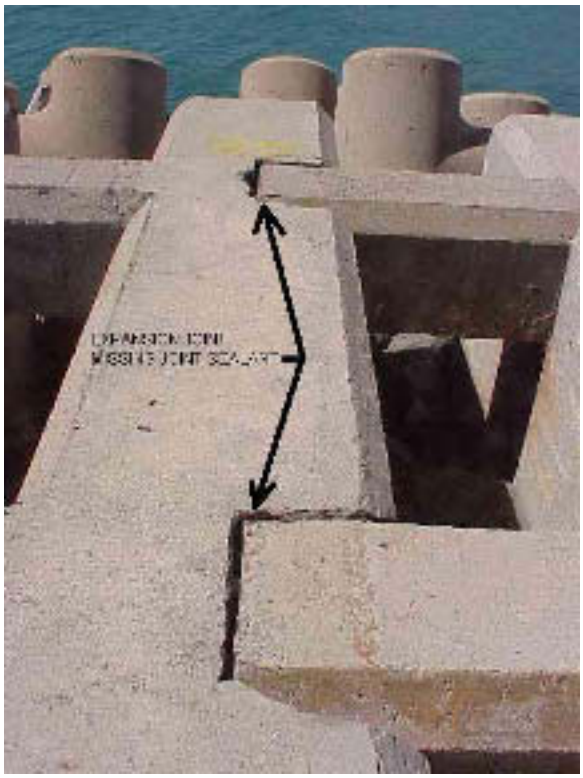
ccc. *Dan's Sta. 31+00, OS, broken tribar



ddd. Dan's Sta. 31+15 = Misc. Part I Sta. 26+10, filler in expansion joint missing on concrete ribcap.

(REACH 2E Dan's Sta. 31+20 to 32+76 = East B/W Sta. 26+15 to 27+71)

eee. *Dan's Sta. 31+55, HS, Broken tribar.

fff. Dan's Sta. 31+51 to 31+93 = East B/W Sta. 26+46 to 26+88, 3' separation from ribcap to tribars; side slope could be settling. Monitor.

ggg. *Dan's Sta. 31+60, OS, cracked tribar (no picture).

hhh. Dan's Sta. 31+75 = East B/W Sta. 26+70, OS, sheared off tribar leg on side slope from weight of tribar above it (no picture).

(NOTE: *Dan's Sta. 32+76 End of Rib)
(*Dan's Sta. 31+29 Red Cross)

(REACH 2E Dan's Sta. 32+77 to 33+32 = East B/W Sta. 27+72 to 28+27)

iii. *Dan's Sta. 33+32, 15 deg HS, broken tribar.

(KED-2 = *Dan's Sta. 33+32)

## WEST BREAKWATER:

**REACH 1A Sta. 1+30 - 2+99**

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*Overview of structure @ Sta. 1+50

**REACH 1B Sta. 3+00 - 7+99**

**REACH 1C Sta. 8+00 - 12+99**

**REACH 1D Sta. 13+00 - 17+49**

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a. *Sta. 13+01 thru 17+41, OS, monitor sideslope for settling and steepening, continue to monitor 4 ea outcroping (rocks/old armor stone) adjacent to toe.

Overview from Sta 17+50 to 0+00.

**REACH 2A Sta. 17+50 - 19+49**

Overview at start of ribcap, from Sta 17+50 to Head Section.

b. Sta. 17+95, HS, 1ea fractured tribar leg on slope.

c. *Sta. 18+45, HS, 1ea broken tribar,# 2/16/83 at mid-section.

d. *Sta. 18+50, HS, 1ea broken tribar, at mid-section ½ down the sideslope # 1/5/83.


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e. *Sta. 19+00, OS, 1 broken tribar at mid-section.

f. Sta. 19+20, HS, Remove dead tree branch from side slope (not pictured).

**REACH 2B Sta. 19+50 - 21+49**


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*Dolo targets MCCP


g. Sta. 19+60, HS, Ribcap corner spalling. Rusted rebar exposed.


h. Sta. 19+84, HS, Ribcap cracked.

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*Overview of Structure @ Sta. 20+00, HS.

i. *Sta. 20+75, OS, 1 broken tribar (shank).


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*Note: Dolo Size 25-ton

j. *Sta. 20+90, OS, 1 broken tribar at mid-section.

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k. *Sta. 20+95 OS, 1 broken tribar down the center.

l. Sta. 21+08, OS, 1 cracked tribar leg at hinge (no picture).

m. Sta. 21+16, OS, 1 fractured tribar on side slope (no picture).


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n. *Sta. 21+40, OS, 3ea broken tribars at mid-section; 1ea broken dolos (shank/fluke).

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o. *Sta. 21+40, OS, Broken tribar # 3/5/69 @ rib cap.

**REACH 2C Sta. 21+50 - 22+99**

p. *Sta. 22+60, OS, 5ea broken dolos (shank/flukes).

q. *Sta. 22+90, OS, 5ea broken dolos (shank/flukes).

**REACH 3 Sta. 23+00 - 23+15**

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*Note: Overview of Dolos @ Sta. 23+00, OS.


r. Sta. 23+00, OS at Head, 1 broken shank dolo at hinge (pictured above) and 1 broken shank dolo at toe (not pictured).

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*Note: Overview of West B/W Head.

*s. Sta. 23+15, Head, -90 deg offset 40', 2ea broken dolos (shank/fluke).

*t. Sta. 23+15, Head, -90 deg offset 20’, 1ea cracked dolos (thru shank).

*u. Sta. 23+15, Head, -85 deg offset 40’, 1ea broken dolos (shank/fluke).

*v. Sta. 23+15, Head, -40 deg offset 45’, 2ea broken dolos (shank).

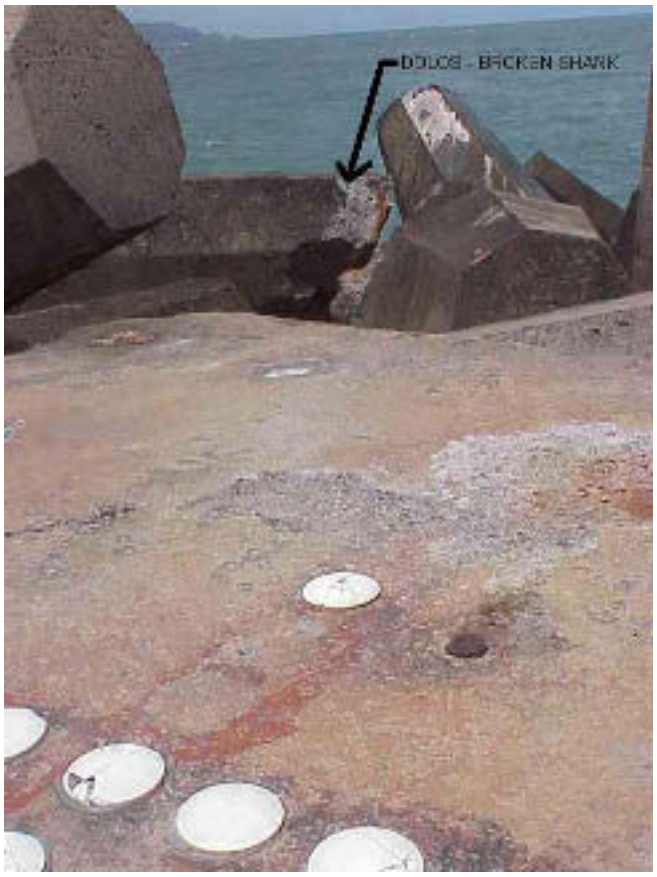
*w. Sta. 23+15, Head, -0 deg offset 60’, 1ea broken dolos (shank/fluke).

*x. Sta. 23+15, Head, +10 deg offset 75’, 1ea broken dolos (shank/fluke).

*y. Sta. 23+15, Head, +30 deg offset 40’, 1ea broken dolos (fluke/shank).

*z. Sta. 23+15, Head, +90 deg offset 50’, 1ea tribar rebar exposed, concrete spalling at shank.

*aa. Sta. 23+15, Head, +90 deg offset 70’, 1ea broken tribar shank.



bb. Sta. 23+25, OS at Head, 1 broken shank dolo (pictured above), and 1 broken fluke shank on near toe (not pictured).

cc. Sta. 23+50, OS at Head, 1 broken shank dolo at water line (not pictured).

*NOTE:

*West B/W's Interior Revetment harbor-side (local's responsibility) not inspected.

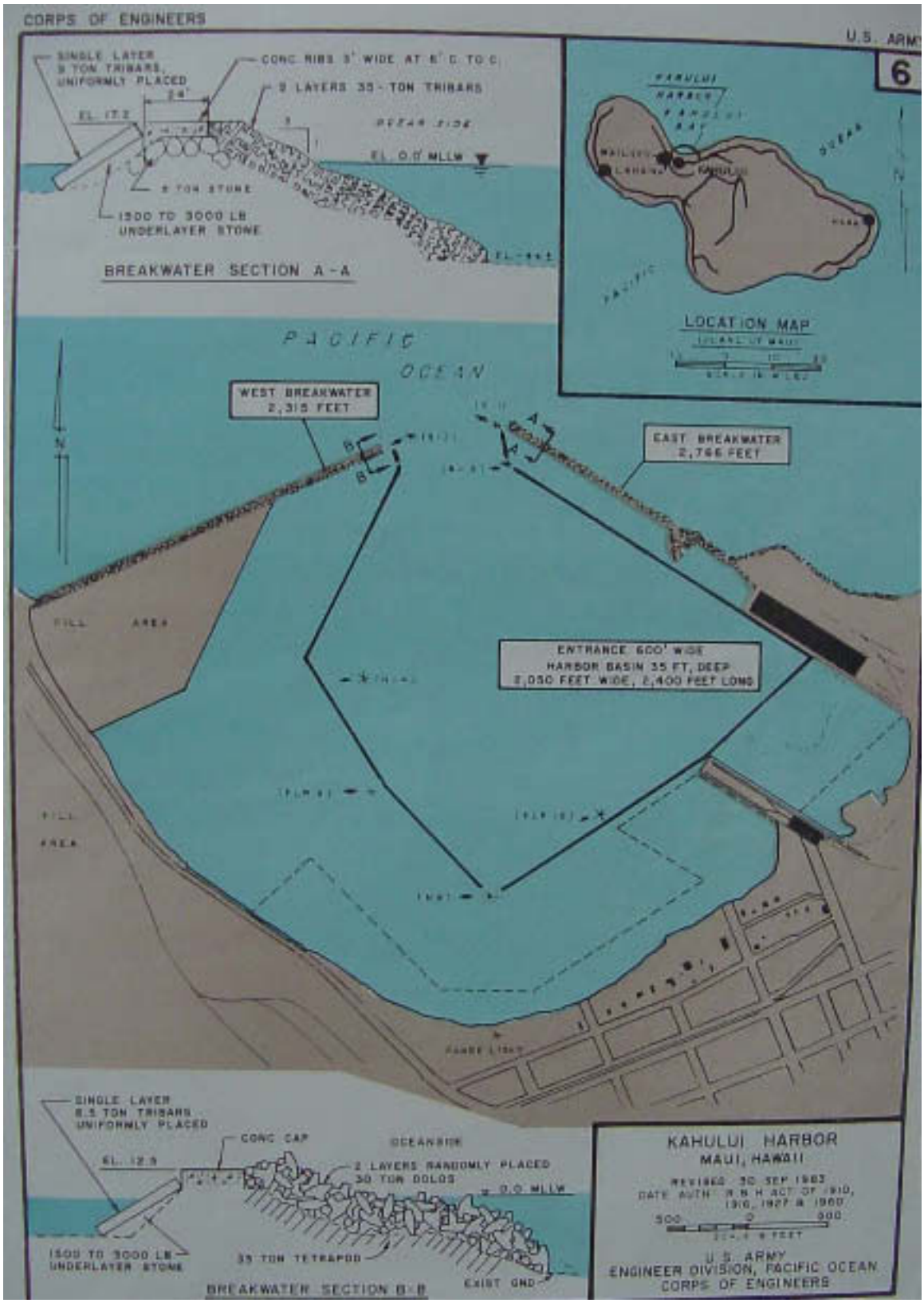
5. Conclusion:

BOTH BREAKWATERS ARE BEGINNING TO SHOW SIGNS OF DOLO MOVEMENT AND SIDESLOPE SETTLING, PARTICULARLY BETWEEN STA. 22+50 - 23+00, OCEANSIDE OF THE WEST B/W AND SEPARATION AT DAN'S STA. 26+00 & STA. 29+00, OCEANSIDE OF THE EAST B/W. THESE AREAS NEED TO BE MONITORED AND COMPARED TO PREVIOUS PHOTOGRAPHS ANNUALLY. THE STRUCTURE REMAINS SERVICEABLE AND NO FAILURE IS ANTICIPATED IN THE NEXT YEAR.

SIGNED:_____
ERIC LI, E.I.T., CIVIL WORKS TECHNICAL BRANCH

SIGNED:_____
JAMES PENNAZ, P.E., Ch, CIVIL WORKS TECHNICAL BRANCH

Enclosure:
- General Site Plan
- Kahului East Breakwater Station Map
- Kahului West Breakwater Station Map
- Condition of Improvement 20 September 1991


CORPS OF ENGINEERS
U.S. ARMY
6
SINGLE LAYER 9 TON TRIBARS, UNIFORMLY PLACED
CONC RIBS 3' WIDE AT 6' C TO C
2 LAYERS 35-TON TRIBARS
EL. 17.2
EL. 0.0 MLLW
8 TON STONE
1500 TO 3000 LB UNDERLAYER STONE
BREAKWATER SECTION A-A
KAHULUI HARBOR
OCEAN
PACIFIC
LOCATION MAP
PACIFIC OCEAN
WEST BREAKWATER 2,315 FEET
EAST BREAKWATER 2,766 FEET
ENTRANCE 600' WIDE
HARBOR BASIN 35 FT. DEEP 2,050 FEET WIDE, 2,400 FEET LONG
FILL AREA
SINGLE LAYER 8.5 TON TRIBARS UNIFORMLY PLACED
CONC CAP
OCEANSIDE
EL. 12.5
2 LAYERS RANDOMLY PLACED 30 TON DOLOS
0.0 MLLW
1500 TO 3000 LB UNDERLAYER STONE
35 TON TETRAPOD
EXIST GND
BREAKWATER SECTION B-B
KAHULUI HARBOR
MAUI, HAWAII
REVISED 30 SEP 1983
DATE AUTH: R.B.H. ACT OF 1910, 1916, 1927 & 1960
500 0 500
SCALE IN FEET
U.S. ARMY
ENGINEER DIVISION, PACIFIC OCEAN
CORPS OF ENGINEERS

## KAHULUI HARBOR, MAUI, HAWAII

**CONDITION OF IMPROVEMENT 30 SEPTEMBER 1991**

**PREVIOUS PROJECTS:** Authorized by the River and Harbor Acts of 25 June 1919, 27 July 1916, and 21 January 1927.

**EXISTING PROJECT:** Authorized by the River and Harbor Act of 14 July 1960. Provides for an east rubblemound breakwater 2,766 feet long; a west rubblemound breakwater 2,315 feet long; an entrance 600 feet wide between the breakwaters; and a harbor basin 2,400 feet long, 2,050 feet wide and 35 feet deep.

**PROGRESS OF WORK**

**Completed and Under Maintenance:** All improvements authorized prior to 1960 were completed in 1931. Work authorized by the Act of 1960 was completed in 1962, except the removal of a rocky shoal area in the northeast edge of the basin which was completed in 1966. Rehabilitation of breakwater was completed in 1966; rehabilitation of breakwater damages was completed in 1969 and breakwater damages repaired in 1973 and 1977. Major rehabilitation of the breakwater was completed in December 1983. Last maintenance dredging was completed in April 1990; total material dredged was 58,000 cubic yards.

**Work Remaining:** None.

**COST OF CONSTRUCTION:**

| Completed Works: | New Work | Maintenance | Rehabilitation | Total |
|---|---|---|---|---|
| United States Funds | $2,388,693 | $7,287,654 | $4,814,528 | $14,490,875 |
| Contributed Funds Required | 30,200 | 0 | 0 | 30,200 |
| Total Costs | $2,418,893 | $7,287,654 | $4,814,528 | $14,521,075 |

**RANGE OF TIDES:** The range of tide between mean lower low water and mean higher high water is 2.5 feet and the extreme range is 4.8 feet.